CLAIMS:

1. For use with a source of electromagnetic energy, a sensor for measuring a measurable parameter, the sensor comprising:

   an electromagnetic resonator, disposed to receive at least a portion of the electromagnetic energy, the electromagnetic resonator having a dielectric body with a sensing surface responsive to changes in the measurable parameter at the sensing surface and the electromagnetic resonator defining a cavity forming a variable gap that varies in response to the sensing surface and that is positioned such that a resonant frequency associated with an electromagnetic standing wave in the dielectric body and the variable gap changes in response to changes in the measurable parameter.

2. The sensor of claim 1, wherein the resonator comprises a dielectric resonator.

3. The sensor of claim 1, wherein the resonator comprises a resonant antenna.

4. The sensor of claim 1, wherein the resonator comprises a resonant transmission line.

5. The sensor of claim 1, wherein the measurable parameter is selected from the group consisting of pressure, temperature, flow rate, material composition, force, and strain.

6. The sensor of claim 1, further comprising a measuring apparatus for measuring a repetition rate of the energy.

7. The sensor of claim 1, wherein the resonator is external to the source.

8. The sensor of claim 1, wherein the resonator is internal to the source, forming a cavity of a mode-locked source.

9. For use with a source of electromagnetic energy, a sensor for use in measuring a measurable parameter, the sensor comprising:

a resonator having a dielectric body with a variable cavity gap responsive to changes in the measurable parameter at a sensing surface, the resonator defining a resonant frequency of a standing electromagnetic wave in the dielectric body and the variable cavity gap that is dependent upon the measurable parameter at the sensing surface, the resonator being disposed such that a signal from the sensor is a function of the resonant frequency.

10. The sensor apparatus of claim 9 wherein the resonator is internal to the source and forms a cavity of the source.

11. The sensor apparatus of claim 9, wherein the resonator forms a resonator that is external to the source.

12. The sensor of claim 9, wherein the resonator comprises a dielectric resonator.

13. The sensor of claim 9, wherein the resonator comprises a resonant antenna.

14. The sensor of claim 9, wherein the resonator comprises a resonant transmission line.

15. The sensor of claim 9, wherein the measurable parameter is selected from the group consisting of pressure, temperature, flow rate, material composition, force, and strain.

16. The sensor apparatus of claim 9, further comprising a measuring apparatus for measuring the frequency of the signal.

17. An apparatus for modulating, based on a measurable parameter, the output of a source producing electromagnetic energy, the apparatus comprising:

a coupler coupled to receive the energy; and

a high Q resonator having a dielectric body with a variable configured to produce an effective dielectric constant that varies in response to changes in the measurable parameter, the high Q resonator coupled to the coupler for receiving the energy and creating an electromagnetic standing wave within the dielectric body and the variable cavity gap at a resonant frequency that is a function of the measurable parameter.

18. The apparatus of claim 35, wherein the measurable parameter is selected from the group consisting of pressure, temperature, flow rate, material composition, force, and strain.

19. The apparatus of claim 17, wherein the source has a resonator characterized by a first Q value Q1, and the high Q resonator is characterized by a second Q value Q2, that is substantially higher then Q1.

20. The apparatus of claim 19, wherein Q2 is at least 100.

21. A variable frequency resonator comprising an electromagnetic resonator having a dielectric body and a cavity defining a variable gap, the resonator producing an output at a resonant frequency that is dependent upon the variable gap which is disposed to alter a ratio of stored electric field and magnetic field energy of an electromagnetic standing wave in response to changes in the measurable parameter.

22. A method of sensing a measurable parameter, the method comprising:

providing a resonator characterized by a resonant frequency that is a function of a variable gap in an internal cavity of a dielectric body of the resonator, the variable gap being responsive to the measurable parameter;

supplying electromagnetic energy to the resonator to produce an electromagnetic standing wave in the dielectric body and the variable gap; and

sensing a resonant frequency of the electromagnetic standing wave to determine the measurable parameter.

23. A method of sensing a measurable parameter, the method comprising the steps of:

providing a pulsed electromagnetic signal characterized by a repetition rate;

providing a resonator having a dielectric body with a variable gap that varies in response to changes in the measurable parameter;

supplying the pulsed electromagnetic signal to the resonator to produce a pulsed electromagnetic wave pattern in the dielectric body and the variable gap; and

sensing variations in the repetition rate of the pulsed electromagnetic signal in response to variations in the variable gap.

24. For use with a electromagnetic source, a resonator having a dielectric body with a variable gap that varies in response to changes in a measurable parameter, the resonator receiving electromagnetic energy from the source to produce an electromagnetic standing wave in the dielectric body and the variable gap so that a characteristic of the energy changes in response to variations in the variable gap.

25. The resonator of claim 30, wherein the electromagnetic energy is a continuous wave and the characteristic is frequency.

26. The resonator of claim 30, wherein the electromagnetic energy is a pulsed energy and the characteristic is repetition rate.

27. An electromagnetic resonant sensor comprising:

a sensor body; and

a cavity within the sensor body having a variable gap between interior surfaces of the sensor body that varies as a function of a measurable parameter, the cavity being positioned within the sensor body so that an electromagnetic standing

wave is formed within the body and the variable gap, and a resonant frequency of the sensor is a function of the measurable parameter.

28. The electromagnetic resonant sensor of claim 27 wherein the sensor body is a dielectric material.

29. The electromagnetic resonant sensor of claim 28 and further comprising:

a conductor on one of the interior surfaces.

30. The electromagnetic resonant sensor of claim 29 wherein the conductor is configured to cause the sensor to resonate as a ring resonator.

31. The electromagnetic resonant sensor of claim 29 wherein the conductor is configured to cause the sensor to resonate as a transmission line.

32. The electromagnetic resonant sensor of claim 29 wherein the conductor is configured to cause the sensor to resonate as a slot antenna.

33. The electromagnetic resonant sensor of claim 29 wherein the conductor is configured to cause the sensor to resonate as a dipole antenna.

34. The electromagnetic resonant sensor of claim 29 wherein the conductor is configured to cause the sensor to resonate as a port antenna.

35. The electromagnetic resonant sensor of claim 28 wherein the sensor body and cavity are configured to resonate at suboptical frequencies.

36. An electromagnetic resonant sensor for receiving electromagnetic energy and producing an output based upon an electromagnetic standing wave having a resonant

frequency that is a function of a parameter to be measured, the sensor characterized by a dielectric body with a variable gap that changes dimension as a function of the parameter, the dielectric body and the variable gap being configured so that the electromagnetic standing wave extends within the dielectric body and the variable gap and a change in gap dimension causes a change in the resonant frequency.